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MS LALEH JALAI
KENYON & KENYON
1500 K STREET, N.W.-SUITE 700
WASHINGTON, DC 20005-1257

EXAMINER

RUTHKOSKY, MARK

ART UNIT PAPER NUMBER

1745

DATE MAILED: 03/21/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

CM

Office Action Summary	Application No.	Applicant(s)	
	09/232,498	MIZUNO, SEIJI	
	Examiner	Art Unit	
	Mark Ruthkosky	1745	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 22 February 2006.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1,3-11,13 and 18-21 is/are pending in the application.
- 4a) Of the above claim(s) 18-21 is/are withdrawn from consideration.
- 5) ☒ Claim(s) 4 and 9 is/are allowed.
- 6) ☒ Claim(s) 1,3,5-8,10,11 and 13 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Specification/New Matter

The objection under 35 U.S.C. 132(a) to the amendment filed 8/5/2005 because it introduces new matter into the disclosure has been overcome by applicant's amendment.

Claim Rejections - 35 USC § 112

The rejection of claims 1, 3, and 5-8 under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement based on the amendment of 8/5/2005 has been overcome by applicant's amendment.

Claim Rejections - 35 U.S.C. § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1, 5, 6, 7, 8 and 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hidekuni (JP 08-151,461) in view of Pellegrini et al. (US 4,197,178.)

The instant claims are to a method of manufacturing a separator for a fuel cell comprising the steps of preparing a raw material by mixing a carbon, an epoxy resin and a phenolic resin, wherein said phenolic resin is different from said epoxy resin, and further wherein a ratio of an

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amount of an epoxy group of said epoxy resin to an amount of a hydroxyl group of said phenolic resin in the raw material is adjusted to a value ranging from 0.8 to 1.2 such that generation of a reaction byproduct gas is minimized, charging the raw material into a predetermined mold; and heat-press forming the raw material charged into the mold into a ribbed separator at a temperature which is from 140 °C to 220 °C, the ribbed separator thus formed having a property or gas-impermeability.

Hidekuni et al. (JP 08-151,461) teaches a method of manufacturing a separator for a fuel cell comprising the steps of preparing a raw material by mixing a carbon, an epoxy resin and a phenolic resin, wherein said phenolic resin is different from said epoxy resin, and further wherein a ratio of an amount of an epoxy group of said epoxy resin to an amount of a hydroxyl group of said phenolic resin in the raw material is adjusted to a value ranging from 0.8 to 1.2 (noted to be 50:50 in paragraphs (pp.) 16-17 and 33), charging the raw material into a predetermined mold (pp. 10 and 29); and heat press forming the raw material charged into a compression mold. Compression is taught to be at a temperature, which is in the range of 140 °C to 220 °C and is referred to compression molding in paragraph 29, (also see paragraphs 10, 29-30, 40, and the claims.) Various epoxy and phenolic resins are noted in paragraphs 13-15. In addition, preferred melting temperatures are given for the epoxy of less than 200 C and greater than 80 C in order to react with the phenolic resins (pp. 13-18.) Graphite fibers are noted with an average particle size of 5-25 μm . It is noted that the method is used to prepare an electrode plate in a fuel cell, which is also used as a separator of adjacent cells. With respect to claim 11, the ratio of the material density is an inherent feature of the materials used and thus, this feature is met by the teachings of the reference.

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The method of manufacturing a separator *for a solid polymer type fuel cell* is noted in the preamble. The recitation has been considered, but is not been given patentable weight because the recitation occurs in the preamble. A preamble is generally not accorded any patentable weight where it merely recites the purpose of a process or the intended use of a structure, and where the body of the claim does not depend on the preamble for completeness but, instead, the process steps or structural limitations are able to stand alone. See *In re Hirao*, 535 F.2d 67, 190 USPQ 15 (CCPA 1976) and *Kropa v. Robie*, 187 F.2d 150, 152, 88 USPQ 478, 481 (CCPA 1951). Further, the phrase “for a solid polymer type fuel cell” describes the intended use of the claimed invention, which must result in a structural difference between the claimed invention and the prior art in order to patentably distinguish the claimed invention from the prior art. If the prior art structure is capable of performing the intended use, then it meets the claim. The separator is not limited by the intended use of the separator.

The Hidekuni (JP 08-151,461) reference does not teach that the mold gives a ribbed separator. Pellegrini et al. (US 4,197,178) teaches a method of preparing a separator wherein a fuel cell separator plate is prepared by mixing a raw material of carbon and a thermosetting resin, such as a phenolic and epoxy resins ((col. 4, lines 45-end, claims 1-3), charging the raw material into a ribbed mold (col. 3, lines 5-15); and heat-press forming the raw material charged into the mold into a ribbed separator at a temperature which is taught to include 140 °C (see col. 3, line 65- col. 4, line 30, figures 1-4 and the claims 1-7.) The separator is gas-impermeable and is pressed adjacent to the solid polymer electrolyte membrane to form a flow path (col. 4, lines 12-end.)

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It would have been obvious to one of ordinary skill in the art at the time the invention was made to prepare a ribbed separator using the method taught by Hidekuni (JP 08-151,461) with a ribbed mold in the compression molding step as taught by Pellegrini et al. (US 4,197,178). The heating and compression method will allow for the formation of a ribbed, conductive carbon plate of carbon particles bound with a conductive polymer. Ribbed separators are well described in the fuel cell art in order to transfer gasses along ribbed gas flow paths to the anode and cathode and generate electricity. The skilled artisan would recognize that employing ribbed molds as taught in Pellegrini et al. (US 4,197,178) in the method taught by Hidekuni (JP 08-151,461) will give ribbed separators that allow for gas flow in a fuel cell. The artisan would have found the claimed invention to be obvious in light of the teachings of the references.

Claims 1 and 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kougorou (JP 59042781), in view of Pellegrini et al. (US 4,197,178.)

Kougorou (JP 59042781, abstract) teaches a method for producing a separator plate for a fuel cell comprising the steps of mixing a carbon powder, an epoxy resin and a phenolic resin, charging the material into a mold and heat pressing (thermal pressure) the material in a temperature range that includes heating to 200 °C and then to a range from 220-270 °C (p. 368 col. 2, lines 1-20.) A specific example shows a paravinylphenol polymer (phenol) and a novolak type phenol resin initial condensate having an epoxy group (epoxy) added to graphite powder. Novolac phenol resins are disclosed. The carbon is graphite less than 100 microns in size. The loading of the material is done at a temperature that is in the range provided in the instant specification to be less than the carbonization temperature of the material. The material is heated

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to 180 and finally to 250 °C to harden the molded body. The reference is silent to the ratio of the epoxy group in the epoxy resin to hydroxyl group of the phenolic resin with regard to being in the range of 0.8 to 1.2. As the epoxy resin is reacted with the phenolic resin, one of ordinary skill in the art would choose to react the functional groups in about a 1:1 stoichiometry as the reaction will go to completion and form the desired product. As an increase in binder material is known in the art to decrease the conductivity of the separator plate, one of ordinary skill in the art would not add excess, unreacted binder material to the separator plate. Further, as the product of the reaction is desired as the binder material, one of ordinary skill would recognize from the teachings of Kougorou that complete reaction between the epoxy resin and a phenolic resin would be desired in the process of making a separator plate.

If the applicant does not agree that the range cited in the claim includes the point of 220 °C (as the matter is subject to a rejection based upon new matter), it would further be obvious to one of ordinary skill in the art at the time the invention was made to heat the mixture of materials to any temperature that would provide a thermosetting reaction between the binder material in the pressure mold. In addition, it is known that temperature and pressure are related and a change in one would affect the other. One of ordinary skill in the art, based on the general knowledge of binding separators in the art and the teachings of Kougorou, would recognize that the binder materials undergo a thermosetting reaction in order to bind the carbon materials in the desired shape of a separator plate. The art would have found the claimed invention to be obvious in light of the teachings of the references. The Kougorou (JP 59042781) reference does not teach that the mold gives a ribbed separator.

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Pellegrini et al. (US 4,197,178) teaches a method of preparing a separator wherein a fuel cell separator plate is prepared by mixing a raw material of carbon and a thermosetting resin, such as a phenolic and epoxy resins ((col. 4, lines 45-end, claims 1-3), charging the raw material into a ribbed mold (col. 3, lines 5-15); and heat-press forming the raw material charged into the mold into a ribbed separator at a temperature which is taught to include 140 °C (see col. 3, line 65- col. 4, line 30, figures 1-4 and the claims 1-7.) The separator is gas-impermeable and is pressed adjacent to the solid polymer electrolyte membrane to form a flow path (col. 4, lines 12-end.)

It would be obvious to one of ordinary skill in the art at the time the invention was made to prepare a ribbed separator using the method taught by Kougorou (JP 59042781) with a ribbed mold in the compression molding step as taught by Pellegrini et al. (US 4,197,178). The heating and compression method will allow for the formation of a ribbed, conductive carbon plate of carbon particles bound with a conductive polymer. Ribbed separators are well described in the fuel cell art in order to transfer gasses along ribbed gas flow paths to the anode and cathode and generate electricity. The skilled artisan would recognize that employing ribbed molds as taught in Pellegrini et al. (US 4,197,178) in the method taught by Kougorou (JP 59042781) will give ribbed separators that allow for gas flow in a fuel cell. The artisan would have found the claimed invention to be obvious in light of the teachings of the references.

Claims 1, 3, 5 and 7-8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kougorou (JP 59042781) in view of Pellegrini et al. (US 4,197,178), as cited in the previous section, and further in view of Sandelli et al. (US 4,643,956.)

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The teachings of Kougorou (JP 59042781, abstract) and Pellegrini et al. (US 4,197,178) have been presented. The references do not teach the selected resins to be bisphenol A resin or a resol phenolic resin or the carbon material to be 5-50 μm in particle size.

Sandelli et al. (US 4,643,956), however, teaches a process for producing a separator plate for fuel cells (col. 4 and examples) which includes an electrode substrate and separator assembly wherein the process includes supplying materials into a mold comprising carbon particles (of 50 microns or less, see col. 3, lines 1-50) and a binder. The binder includes phenol resins, such as resols and novolacs, (see claim 3, col. 3-4 and examples.) The plates are preferably molded at a temperature of 149-176 $^{\circ}\text{C}$ (col. 34, lines 35-55.)

It would be obvious to one skilled in the art at the time the invention was made to use the phenol binder resins taught in Sandelli as the phenol component of the binder material in the Kougorou (JP 59042781) separator plate as the materials are shown to bind carbon into a sturdy, conductive plate for fuel cell applications. It would further be obvious to one skilled in the art at the time the invention was made to pressure mold the separator at a temperature of 149-176 $^{\circ}\text{C}$, as taught by Sandelli et al. (US 4,643,956, col. 34, lines 35-55) in order to provide a molded plate, as these temperatures provide a carbonaceous material bound and pressed together to form a separator plate. The plates are surface ground (col. 4, lines 55-60.) Kougorou (JP 59042781) teaches the plate with an epoxy/phenol binder has improved chemical resistance, heat resistance and gas impermeability, which are features desirable for such a separator as taught by Sandenelli. The use of such carbonaceous plates as separators is well known in fuel cell assemblies.

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Claims 1, 3, 5-8 and 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sandelli et al. (US 4,643,956), in view of Hidekuni (JP 08-151,461) OR Kougorou (JP 59042781, abstract, and further in view of Pellegrini et al. (US 4,197,178), as previously applied.

Sandelli et al. (US 4,643,956) teaches a process for producing (col. 4 and examples) a separator plate for fuel cells which includes an electrode substrate and separator assembly where the process includes supplying materials into a mold comprising a carbon (carbon particles of 50 microns or less, see col. 3, lines 1-50), and a binder (can be phenol resins, including novolacs, see claim 3, col. 3-4 and examples.) The mold-pressing step is preferably done at 300-350 °F (see the example, 300-350 F corresponds to about 149-176 C.) While this process teaches the binder can be a mixture of phenolic resins, it does not teach a process for mixing phenolic resins and epoxy resins to form a separator (col. 20, line 10.)

Hidekuni (JP 08-151,461), however, teaches a process for producing a plate for fuel cells, as previously noted, where the process includes supplying materials into a mold, wherein the materials comprise carbon (carbon particles of 5-25 microns are shown in paragraph 12), and a binder of phenolic and epoxy resins, to form a plate (can be phenol resins, including novolacs, see p. 13-16.) The amount of epoxy relative to the phenolic resin is 5-50%, which falls in the range of 1:1 (p. 33). Compression molding with heat is disclosed in p 29. The loading of the material is done at a temperature that is in the range provided in the instant specification to be less than the carbonization temperature of the material (see paragraphs 13-18 of JP '461). It is noted that an electrode plate is equivalent to a separator plate in a fuel cell as the plate includes a catalyst electrode that is adjacent to an electrolyte membrane while separating the electrode material from the adjacent unit cell.

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Kougrou (JP 59042781, abstract) teaches a method for producing a separator plate for a fuel cell comprising the steps of mixing a carbon powder, an epoxy resin and a phenolic resin, charging the material into a mold and heat pressing (thermal pressure) the material (as previously noted) in a temperature range that includes heating to 200 °C and then to a range from 220-270 °C (p. 368 col. 2, lines 1-20.)

It would be obvious to one skilled in the art at the time the invention was made to use the molding composition presented in Hidekuni (JP 08-151,461) OR Kougrou (JP 59042781) as the binder of Sandelli et al. (US 4,643,956) as the materials are shown to bind carbon into a smooth, conductive plate for fuel cell applications. The JP 08-151,461 teaches the plate has improved smoothness and porosity using the method and binder described. One of ordinary skill in the art would have the knowledge to use these binder/carbonaceous plates as separators for in fuel cell assemblies as the plates will provide desirable characteristics known in the art for such fuel cell stacks. It is also obvious to one of ordinary skill in the art to use cresol novolak and bisphenol A type epoxy resins as the epoxy resin binder in a fuel cell, and cresol phenolic resins as the phenol resin binder in a fuel cell. These specific resins are commonly used in the art as binders (see Hasegawa US 4,369,238, claim 2; and Sugaya US 5,128,378, col. 4, lines 60+ for examples,) in polymeric separators in electrochemical devices.

Pellegrini et al. (US 4,197,178) teaches a method of preparing a separator wherein a fuel cell separator plate is prepared by mixing a raw material of carbon and a thermosetting resin, such as a phenolic and epoxy resins ((col. 4, lines 45-end, claims 1-3), charging the raw material into a ribbed mold (col. 3, lines 5-15); and heat-press forming the raw material charged into the mold into a ribbed separator at a temperature which is taught to include 140 °C (see col. 3, line

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65- col. 4, line 30, figures 1-4 and the claims 1-7.) The separator is gas-impermeable and is pressed adjacent to the solid polymer electrolyte membrane to form a flow path (col. 4, lines 12-end.)

It would be obvious to one of ordinary skill in the art at the time the invention was made to prepare a ribbed separator using the method taught by Sandenelli with a ribbed mold in the compression molding step as taught by Pellegrini et al. (US 4,197,178). The heating and compression method will allow for the formation of a ribbed, conductive carbon plate of carbon particles bound with a conductive polymer. Ribbed separators are well described in the fuel cell art in order to transfer gasses along ribbed gas flow paths to the anode and cathode and generate electricity. The skilled artisan would recognize that employing ribbed molds as taught in Pellegrini et al. (US 4,197,178) in the method taught by the applied references will give ribbed separators that allow for gas flow in a fuel cell. The artisan would have found the claimed invention to be obvious in light of the teachings of the references.

Claims 1, 3, 5-8 and 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kougorou (JP 59042781, abstract) in view of Pellegrini et al. (US 4,197,178). as previously applied, and further in view of Hidekuni (JP 08-151,461.)

The teachings of Kougorou (JP 59042781, abstract) in view of Pellegrini et al. (US 4,197,178) have been made of record. The references are silent to the ratio of the epoxy group in the epoxy resin to hydroxyl group of the phenolic resin with regard to being in the range of 0.8 to 1.2. Hidekuni (JP 08-151,461), however, teaches a process for producing a plate for fuel cells where the process includes supplying materials into a mold, wherein the materials comprise

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carbon (carbon particles of 5-25 microns are shown in paragraph 12), and a binder of phenolic and epoxy resins, to form a plate (can be phenol resins, including novolacs, see p. 13-16.) The amount of epoxy relative to the phenolic resin is 5-50%, which falls in the range of 1:1 (p. 33). Compression molding with heat is disclosed in p 29. The compression temperature falls in the range of 140-220 °C. The loading of the material is done at a temperature that is in the range provided in the instant specification to be less than the carbonization temperature of the material (see paragraphs 13-18 of JP '461).

It would be obvious to one skilled in the art at the time the invention was made to use the molding composition presented in Hidekuni (JP 08-151,461) as the binder of Kougorou (JP 59042781, abstract) as equivalent materials are shown to bind carbon into a smooth, porous conductive plate for fuel cell applications. Hidekuni (JP 08-151,461) teaches the plate has improved smoothness and porosity using the method and binder described. One of ordinary skill in the art would have the knowledge to use such carbonaceous plates as separators for in fuel cell assemblies as the plates will provide desirable characteristics known in the art for such fuel cell stacks. As the materials of JP 08-151,461 are reacted in a range of 0.8-1:1, it would be obvious to use the same ratio of materials in the Kougorou (JP 59042781, abstract) separator as the material is shown to bind the carbon into a conductive plate. As the epoxy resin is reacted with the phenolic resin, one of ordinary skill in the art would choose to react the functional groups in about a 1:1 stoichiometry as the reaction will go to completion and form the desired product. As an increase in binder material is known in the art to decrease the conductivity of the separator plate, one of ordinary skill in the art would not add excess, unreacted binder material to the separator plate. In addition, as the product of the reaction is desired as the binder material, one

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of ordinary skill would recognize from the teachings of Kougorou that complete reaction between the epoxy resin and a phenolic resin would be desired in the process of making a separator plate. It is further obvious to one of ordinary skill in the art to use cresol novolak and bisphenol A type epoxy resins as the epoxy resin binder in a fuel cell, and resol phenolic resins as the phenol resin binder in a fuel cell. These specific resins are commonly used in the art as binders (see Hasegawa US 4,369,238, claim 2; and Sugaya US 5,128,378, col. 4, lines 60+ as examples.) for polymeric separators in electrochemical devices.

Claim 13 is rejected under 35 U.S.C. 103(a) as being obvious over Taylor (US 4,592,968) OR Sandelli (US 4,643,956), in view of Pellegrini et al. (US 4,197,178.)

Taylor (US 4,592,968) teaches method of manufacturing a separator for a fuel cell comprising the steps of mixing a carbon, and a resin, charging the material into a mold, heat pressing the material and grinding a surface of the separator (see example 1, col. 8, lines 5-25.) The molding temperature in the example provided in col. 8 is 149 °C. The completion of manufacturing grinding step is performed before carbonization of the separator plate. The material is not baked. Taylor does not teach the method of manufacturing the separator without baking the separator.

Sandelli et al. (US 4,643,956), however, teaches a process for producing a separator plate for fuel cells (col. 4 and examples) which includes an electrode substrate and separator assembly wherein the process includes supplying materials into a mold comprising a carbon (carbon particles of 50 microns or less, see col. 3, lines 1-50), and a binder. The binder includes phenol resins, such as resols and novolacs, (see claim 3, col. 3-4 and examples.) The plates are

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preferably molded at a temperature of 149-176 °C (col. 34, lines 35-55.) Sandelli does not teach the method of manufacturing the separator without baking the separator.

It would be obvious to one of ordinary skill in the art at the time the invention was made to manufacture a separator using the methods taught by Taylor and Sandelli without baking the separator, as the methods taught in Taylor and Sandelli include the steps of mixing the materials and heat pressing the material in order to make a separator for a fuel cell. One of ordinary skill in the art would recognize from that teachings that the step of baking the fuel cell is not necessary as the materials will effectively separate fuel cell units without being baked. The baking step merely improves the electrical conductivity of the separator by carbonizing the nonconductive binder to a conductive carbon material. By not completing this step, the skilled artisan will sacrifice the conductivity of the separator for allowing the binder to remain in the cell, which will improve the binding of the separator. The artisan would have found the claimed invention to be obvious in light of the teachings of the references.

The Taylor (US 4,592,968) and Sandelli (US 4,643,956) references do not teach that the mold gives a ribbed separator. Pellegrini et al. (US 4,197,178) teaches a method of preparing a separator wherein a fuel cell separator plate is prepared by mixing a raw material of carbon and a thermosetting resin, such as a phenolic and epoxy resins ((col. 4, lines 45-end, claims 1-3), charging the raw material into a ribbed mold (col. 3, lines 5-15); and heat-press forming the raw material charged into the mold into a ribbed separator at a temperature which is taught to include 140 °C (see col. 3, line 65- col. 4, line 30, figures 1-4 and the claims 1-7.) The separator is gas-impermeable and is pressed adjacent to the solid polymer electrolyte membrane to form a flow path (col. 4, lines 12-end.)

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It would have been obvious to one of ordinary skill in the art at the time the invention was made to prepare a ribbed separator as taught by Taylor (US 4,592,968) and Sandelli (US 4,643,956) with a ribbed mold in the compression molding step as taught by Pellegrini et al. (US 4,197,178). The heating and compression method will allow for the formation of a ribbed, conductive carbon plate of carbon particles bound with a conductive polymer. Ribbed separators are well described in the fuel cell art in order to transfer gasses along ribbed gas flow paths to the anode and cathode and generate electricity. The skilled artisan would recognize that employing ribbed molds as taught in Pellegrini et al. (US 4,197,178) in the methods taught by Taylor (US 4,592,968) and Sandelli (US 4,643,956) will give ribbed separators that allow for gas flow in a fuel cell. The artisan would have found the claimed invention to be obvious in light of the teachings of the references.

Claim 10 is rejected under 35 U.S.C. 103(a) as being unpatentable over Taylor (US 4,592,968) OR Sandelli et al. (US 4,643,956), as described with regard to claim 13 in the previous section, in view of Hidekuni et al. (JP 08-151,461) OR Kougorou (JP 59042781, abstract), and further in view of Pellegrini et al. (US 4,197,178.)

The teachings of Taylor (US 4,592,968) and Sandelli et al. (US 4,643,956) have been previously described with reference to claim 13. These references do not teach preparing a binder material by mixing a carbon, an epoxy resin and a phenolic resin, wherein said phenolic resin is different from said epoxy resin

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Hidekuni et al. (JP 08-151,461) teaches a method of manufacturing a separator for a fuel cell comprising the steps of preparing a binder material by mixing a carbon, an epoxy resin and a phenolic resin, wherein said phenolic resin is different from said epoxy resin.

Kougorou (JP 59042781, abstract) teaches a method for producing a separator plate for a fuel cell comprising the steps of mixing a carbon powder, an epoxy resin and a phenolic resin, wherein said phenolic resin is different from said epoxy resin. It would be obvious to one of ordinary skill in the art at the time the invention was made to use a binder material of a carbon, an epoxy resin and a phenolic resin, wherein said phenolic resin is different from said epoxy resin as the binder used in the separator plates taught by Taylor (US 4,592,968) and Sandelli et al. (US 4,643,956) as the binder will provide a thermoset bound carbon separator plate for use in fuel cell applications. Use of these binders provides well bound, plates with smooth surfaces. The artisan would have found the claimed invention to be obvious in light of the teachings of the references.

The references do not teach that the mold gives a ribbed separator. Pellegri et al. (US 4,197,178) teaches a method of preparing a separator wherein a fuel cell separator plate is prepared by mixing a raw material of carbon and a thermosetting resin, such as a phenolic and epoxy resins ((col. 4, lines 45-end, claims 1-3), charging the raw material into a ribbed mold (col. 3, lines 5-15); and heat-press forming the raw material charged into the mold into a ribbed separator at a temperature which is taught to include 140 °C (see col. 3, line 65- col. 4, line 30, figures 1-4 and the claims 1-7.) The separator is gas-impermeable and is pressed adjacent to the solid polymer electrolyte membrane to form a flow path (col. 4, lines 12-end.)

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It would have been obvious to one of ordinary skill in the art at the time the invention was made to prepare a ribbed separator as taught by Taylor (US 4,592,968) and Sandelli (US 4,643,956) with a ribbed mold in the compression molding step as taught by Pellegrini et al. (US 4,197,178). The heating and compression method will allow for the formation of a ribbed, conductive carbon plate of carbon particles bound with a conductive polymer. Ribbed separators are well described in the fuel cell art in order to transfer gasses along ribbed gas flow paths to the anode and cathode and generate electricity. The skilled artisan would recognize that employing ribbed molds as taught in Pellegrini et al. (US 4,197,178) in the methods taught by Taylor (US 4,592,968) and Sandelli (US 4,643,956) will give ribbed separators that allow for gas flow in a fuel cell. The artisan would have found the claimed invention to be obvious in light of the teachings of the references.

Allowable Subject Matter

Claims 4 and 9 are allowed.

The following is an examiner's statement of reasons for allowance:

With regard to claim 4, which is to a method of manufacturing a separator for a fuel cell comprising the steps of mixing a carbon, and a resin, charging the material into a mold, heat pressing the material and grinding a surface of the separator. The claim includes the limitation of glycidylamine as the epoxy resin. The most pertinent prior art has been noted in the claims. The prior art does not teach this method including glycidylamine as the epoxy resin of the separator.

With regard to claim 9, which is to a method of manufacturing a separator for a fuel cell comprising the steps of mixing a carbon, and a resin, charging the material into a mold, heat pressing the material and grinding a surface of the separator. The method step includes preparing a slurry with resin particles with specific sizes and particle size distributions that are prepared by spraying and drying the slurry. The most pertinent prior art has been noted in the claims. The prior art does not teach this method including the step of preparing a slurry with resin particles with specific sizes and particle size distributions which are accomplished by spraying and drying the slurry. Thus, these claims are allowed.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Response to Arguments

Applicant's arguments filed 2/22/2006 have been fully considered but they are not persuasive. The arguments based on the rejections based on 35 U.S.C. 103 have been considered but are moot in view of the new ground(s) of rejection based on the applicant's amendments to the claims.

With regard to the rejection of claims 10 and 13, the applicant argues that the claimed step of completing the manufacture of a separator without baking would not be obvious and that such a rejection is based on hindsight reasoning. The examiner disagrees. The references teach preparing a separator plate by mixing a resin with a conductive carbon material and heat-press

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forming the material into a plate. The only difference between the prior art and the instant claims is that the prior art includes the additional step of heating the plate in order to improve the conductivity of the plate. The skilled artisan would understand from the teachings of the applied references that the formed plate prepared before the baking step would both separate components of the fuel cell and conduct electricity based on the conductive carbon. The art merely recognizes that heating the plate will improve the conductivity of the plate.

In response to applicant's argument that the examiner's conclusion of obviousness is based upon improper hindsight reasoning, it must be recognized that any judgment on obviousness is in a sense necessarily a reconstruction based upon hindsight reasoning. But so long as it takes into account only knowledge which was within the level of ordinary skill at the time the claimed invention was made, and does not include knowledge gleaned only from the applicant's disclosure, such a reconstruction is proper. See *In re McLaughlin*, 443 F.2d 1392, 170 USPQ 209 (CCPA 1971). In the instant rejections, the knowledge of constructing a plate without baking was within the level of ordinary skill at the time the claimed invention was made because the plate is made prior to the baking step. The heating step has been shown to improve the conductivity of the plate by carbonizing the binder. The fact that the plate has improved conductivity by baking the plate does not include knowledge gleaned only from the applicant's disclosure because the plate has been shown to have less attractive conductivity when noncarbonized binders are used. As the rejection is not based on knowledge gleaned only from the applicant's disclosure, such a reconstruction is proper.

The applicant has not provided *unexpected* results or evidence that the removal of the baking step from the method is critical to the invention. The prior art recognizes that the baking

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step improves the conductivity of the separator. In fact, the applicant's specification discloses baking the formed separator in a subsequent step on page 18, lines 15-20. Thus, the claims are considered obvious over the teachings of the prior art.

Examiner Correspondence

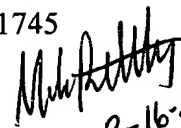
Any inquiry concerning this communication or earlier communications from the examiner should be directed to Mark Ruthkosky whose telephone number is 571-272-1291. The examiner can normally be reached on FLEX schedule (generally, Monday-Thursday from 9:00-6:30.) If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Patrick Ryan can be reached at 571-272-1292. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Mark Ruthkosky

Primary Patent Examiner

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3-16-2006